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How contractors and builders can profit from facts



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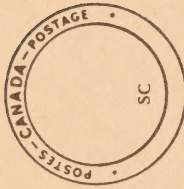
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"How Contractors and Builders Can Profit From Facts"

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| <input type="checkbox"/> Trade contractor | <input type="checkbox"/> Member of Parliament | |
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- | | | | | | |
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Comments/Suggestions:

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Do you want to

- estimate the size of your potential market?
- find out more about your residential customers
 - where they live, what sort of dwellings they live in, and when these dwellings were built?
- determine trends in your industry?
- compare your costs with those of your industry?
- prepare an escalation clause in a contract?

DEPOSITORY LIBRARY MATERIAL

if you do,
but you don't know how to,
this booklet can help you.



How contractors and builders can profit from facts

An introduction to the use of statistics
prepared by the User Advisory Services Division
of Statistics Canada for the
owners and managers of the
thousands of small contracting and building
businesses in Canada.

This document was prepared in cooperation
with Canada's construction industry.

There is a \$1.00 handling fee for this publication

December 1979



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Introduction

To many owners and managers of businesses, Statistics Canada is a government agency which asks a lot of questions that take time and money to answer. What is less widely known is that, as a result of asking those questions, Statistics Canada has a lot of answers — answers which can help business people in small and large companies operate more efficiently and effectively.

Large companies, with economic and research staffs, tend to be aware of the kinds of information published by Statistics Canada and how it can be used. This booklet is designed to illustrate how this information can help the managers of smaller businesses who are not familiar with what is available and have little or no training in the use of statistics.

Some years ago, the then Dominion Bureau of Statistics produced a booklet illustrating how an owner-operator of a small business could

take advantage of Canada's official statistics. Its popularity has prompted Statistics Canada to plan a series of booklets, each one aimed at a different sector of business. This one is designed for contractors and builders and is the third booklet in the series. The first, published in April, 1977, was for manufacturers and the second, published in April, 1978, was for retailers.

In this booklet, case studies are used to illustrate the information available from Statistics Canada and some of the ways it can be used. Although the cases are fictitious, they are all typical of the way Statistics Canada information is used by businesses. The fact that a particular type of contracting or building business or a particular type of problem is not discussed here does not mean that information relevant to it is not available. It probably is. A section is included on where to begin a search for data. For easy reference, a list of the regional offices of Statistics Canada is given at the back of the book on page 58.

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The Value of Statistics

The manager of a small enterprise wears many hats. At one and the same time, he or she has to be an expert in finance, production, marketing, purchasing, labour relations, and so on. Each day decisions have to be made, some of which affect the day-to-day operation of the business, while others relate to the longer term.

How does one go about reaching a good decision? Obviously the process will vary depending upon the person and the type of decision. However, it is generally true to say that the more factual the information the decision maker has, the better the chances of arriving at a good decision.

The information may take many forms — it may be internal information from a firm's records, or it may be external information on the value of sales of an industry, the numbers of persons employed, the size, location and characteristics of a market, etc. This is where Statistics Canada can help.

Statistics Canada publishes information on a wide range of subjects. There are reports on individual industries, information on prices, wages, agriculture, transport, communication, construction, imports and exports, government finance, public health and hospitals, education, family expenditures, population, housing, retail trade, the administration of justice, and much more.

With this kind of information, it is possible to compare the performance of an individual firm with that of others in the industry or to find out if the market for a product is expanding or contracting. Market size and share, seasonal patterns, price changes, wage costs, operating ratios, and business prospects are the things which concern business people, and they can all be calculated from Statistics Canada data.

Statistics Canada information is mainly derived from the surveys it carries out. For the protection of respondents, the Statistics Act, which governs Statistics Canada's operations, does not permit information to be published in any way that would identify an individual business or person. Subject to this basic restriction, however, Statistics Canada's policy is to make as much useful information available to as many people as possible, and at minimal cost.

Published statistics are rarely the complete answer to a problem, and anyone using statistics should also make use of the many other sources of information available to business people. Nevertheless, Statistics Canada is probably the most important single source of external information, and the following case studies illustrate how some of the information it publishes can be used and what type of questions it can answer or help to answer.

The case summaries, with their corresponding detailed case studies, are also designed to show that making use of statistics does not necessarily require any formal training or help from outsiders. The information is readily available, and most of it is easily understandable. The ability to do ordinary arithmetic and to think in an orderly fashion are often the only skills required.

The fictitious case studies described in this booklet are presented both in short summary form and also, in a separate section, in fuller detail.

The summary versions contain sufficient detail to meet the needs of many readers. They provide enough information to offer good examples of the ways statistics can be used in the construction industry without going into details of how to locate data or how to make the necessary calculations. Readers wanting to know these specific procedures will find the section containing the detailed case studies more useful for their purposes.

Case Summaries

This section contains fictitious *summary* accounts of applications of statistical data by businessmen in the construction industry.

More detailed accounts of these same case studies are offered in the section after these summaries.

Case No. 1 — Defining and locating a potential market

Defining the Market

Henri Coutu, the owner of a small contracting business doing home renovations, was thinking of specializing in home insulation work. Before investing time and money in this field he wanted to determine the potential demand for this type of work within the city that was his own operating area. It occurred to him that statistics might help.

Henri was aware that there existed a federal government Home Insulation Program which offered subsidies for insulation work done on houses built before 1946 and that this Program would probably be extended to cover houses built after 1946. This implied that those houses built before 1946 were a prime part of his current potential market and that houses built after that date would come into this prime market in future years. Also, it seemed likely that owner-occupied houses were a more important potential market for insulating work than rented homes. As work on apartment buildings demanded specialized equipment and experience, he did not regard these buildings as likely prospects for his potential market.

Therefore he decided that his prime market was likely to be owner occupied single-family dwellings of a certain age. This was the type of building about which he needed to gather statistical information. The information he most needed to know was how many such buildings there might be within his operating area and where they might be concentrated.

By visiting a Regional Advisor at the nearest of the nine regional reference centres of Statistics Canada (listed on page 58) Henri was able

to quickly determine that it would be possible to obtain the information he needed. The Regional Advisor's office maintained an extensive collection of current statistical data and also provided a free service to assist businessmen and other clients in seeking out and assembling statistical data.

Age of Houses

To begin with, the Regional Advisor produced the following table to come up with some idea of the age of houses within Henri's business operating area and their "tenure". Tenure simply means whether a house is owned or rented.

With this table it was possible to determine the numbers of houses built during various periods of construction.

It was apparent that there had been a period of heavy construction between 1951 and 1965, and it was likely that dwellings built during this period would become due for further insulation work in the coming years. Although it could not be assumed that property owners would decide to insulate their dwellings only if and when the Home Insulation Program covered the period in which they were built, it was felt that this possibility could be relied upon as a guideline to indicate market potential. The availability of government subsidies could be expected to have a significant impact on the willingness of homeowners to insulate their houses. Thus there was evidence in these statistics of an expanded market for home insulating services in the years ahead. It was also seen from this table that more than 60% of the dwellings in this area were occupied by their owners.

Occupied Dwellings*
by Tenure and Period of Construction
City of Laval

| Period of Construction | Total | Owned | Rented |
|------------------------|--------|--------|--------|
| Before 1946 | 5,325 | 2,740 | 2,595 |
| 1946-1950 | 3,650 | 1,890 | 1,755 |
| 1951-1960 | 19,050 | 13,545 | 5,510 |
| 1961-1965 | 16,685 | 11,990 | 4,695 |
| 1966-1971 | 11,910 | 5,855 | 6,055 |
| Total | 56,630 | 36,015 | 20,615 |

Note * all types including apartments

Pinpointing the Market

Henri made the assumption that most owner-occupants would be living in single-family dwellings. To test this idea, statistics were gathered in the form of the table below.

Occupied Dwellings by
Type and Tenure, 1971
City of Laval

| Type | Total | Owned | Rented |
|------------------|--------|--------|--------|
| Single detached | 32,865 | 29,905 | 2,965 |
| Single attached | 7,030 | 3,160 | 3,870 |
| Sub-total | 39,895 | 33,065 | 6,835 |
| Duplex | 7,635 | 2,265 | 5,370 |
| Apartment, Other | 8,935 | 515 | 8,420 |
| Total | 56,465 | 35,845 | 20,625 |

From this table it could be seen that 33,065 (29,905 plus 3,160), or 92%, of the 35,845 owner-occupants live in single dwellings. Similarly, the figures showed that 58% of all dwellings in Henri's operating area were single dwellings which were occupied by their owners — the probable prime market for home insulation work.

To help determine where, within his possible operating area, he might expect to find concentrations of this target group of houses, Henri was shown a map in which his operating area was divided into a number of smaller areas each consisting of about 5,000 population. He was also shown a table of statistics in which housing data were listed for each of these smaller areas. The ideal information needed at this point would have been a table showing the

number of owner-occupied single houses by periods of construction for each of the smaller areas into which the business operating area was divided. In fact, these precise statistics could have been obtained at nominal cost by the Statistics Canada Regional Advisor by a special

request to the main computer in Ottawa. However it was possible to get almost the same information from documents kept in the reference centre and it was agreed that this would be satisfactory for the purposes of the market study. Using the available statistics, it was possible to locate the particular areas within the total operating area where demands for home insulation work were likely to be concentrated.

In a visit of only two or three hours, Henri had been able to establish the basis for making a reasonably well-informed decision about whether to invest or not. He had some indications of both the size of his potential market and where, within his operating area, it was likely to be concentrated.

Case No. 2 – Assessing a competitive position an application of statistics in financial analysis

What is Financial Analysis?

Financial analysis is simply an examination of the financial statements of a business in order to determine its financial situation. The financial statements most used are the income statement (sometimes called the profit and loss statement) and the balance sheet.

The income statement lists revenues and expenses to show clearly the results of the activities of the business over the duration of the operating period to which it refers. The balance sheet records the financial position of the firm at a single point of time at the end of the operating period. Taken together these two statements contain enough information to give a good summary of the most recent performance of the business and its present position. Also, by comparing income statements and balance sheets from one year to another, it is possible to identify persistent problems and trends.

Short examples of an income statement and balance sheet are shown below. Normally the financial statement values for individual items of revenue, expense, assets, and so forth would be recorded in dollar values. In this example they have been expressed as ratios to assist in illustrating a useful way of presenting financial information.

One of the ways in which statistical data can be most valuable to businessmen is when they are used to compare financial data for a single business with the average figures for the industry as a whole. This gives the businessman a chance to determine how well his firm is doing by comparison with other firms in the same industry.

Financial analysis of this sort generally involves the examination of financial ratios which are the same as or similar to those shown for

Sample Financial Statements

1977 Operating Year for XYZ Highway Contracting Ltd.

(a non-existent company)

| Income Statement | | | Balance Sheet | | |
|--|-----------------------------------|--------------------------------------|---------------|------------------------|--|
| | (as % of total operating revenue) | | | (as % of total assets) | |
| 1. Total operating revenue | 100.0 | 14. Total assets | 100.0 | | |
| 2. Construction revenue | 100.0 | 15. Accounts receivable | 20.5 | | |
| 3. Other revenue | — | 16. Other current assets | 42.0 | | |
| 4. Total Operating costs | 96.6 | 17. Fixed assets (less depreciation) | 33.0 | | |
| 5. Payments to subcontractors | 10.1 | 18. Other long-term assets | 4.5 | | |
| 6. Materials | 19.3 | | | | |
| 7. Wages | 22.3 | | | | |
| 8. Salaries | 5.0 | | | | |
| 9. Repairs to machinery and equipment | 10.6 | | | | |
| 10. Repairs to buildings | 0.1 | | | | |
| 11. Depreciation | 5.9 | | | | |
| 12. Other costs | 23.3 | | | | |
| 13. Net operating profit (loss) before taxes | 3.4 | | | | |

Source: The 1977 Census of Highway, Road, Street and Bridge Contracting Industry, Province of British Columbia (Cat. no. 64-206)

the individual items in the sample financial statements above.

Financial ratios are among the most important "tools" available for financial analysis. They are particularly well suited for comparing a single business to a statistical average because they have the effect of eliminating much of the problem of interpreting figures from various business operations of different sizes. It is possible to present any income statement in common-size terms by expressing each component as a percentage of operating revenue. This produces a set of ratios which can be readily compared with financial statistics showing the industry averages for the same ratios. (Refer page 10)

The value of this approach is illustrated in the following.

**Declining Profits
and Declining Market Share**

Mr. Paul Even, the owner of Roadrunner, a small general contracting business specializing in highway, road, street and bridge construction in British Columbia, was concerned that his firm was losing business. It was evident that this was happening as the result of his company having submitted too many uncompetitive bids and that these higher bids were the result of higher mark-ups added recently to cover substantially higher

operating costs. However, if his own costs were rising, Paul reasoned, his competitors must presumably be experiencing the same problems so that their mark-ups should also have risen. No obvious solution presented itself and from the information at hand it was difficult to determine what steps he should take to get his business growing again. Not wanting to take the simple but risky approach of reducing mark-ups, he decided first to assess his competitive position.

He began by reviewing his own financial statements to assemble figures on his net operating profits. It was apparent from these figures that, despite the past effort to achieve a higher markup, net operating profit as a percentage of net operating revenue actually declined in 1974 and 1975. This development, particularly in view of his recent loss of market share, convinced Paul that he should compare the financial data for his company with the average figures for his industry. For this purpose, he knew that he would need to obtain statistical information so he visited a regional reference centre of Statistics Canada to see what was available.

To assist Paul in determining how his company's growth rate compared with the average of other general contractors in his region, the Statistics Canada Regional Advisor prepared the following table on the growth of the highway, road, street and bridge construction industry in his region.

Highway, Road, Street and Bridge Construction
Total Work Performed in B.C.

| Year | New Construction | | Repair Construction | | Total | |
|------|------------------|----------------------------|---------------------|----------------------------|------------------|----------------------------|
| | Value (\$000) | Increase from 1971 % | Value (\$000) | Increase from 1971 % | Value (\$000) | Increase from 1971 % |
| 1971 | 204,813 | | 47,341 | | 252,154 | |
| 1972 | 245,658 | 19.9 | 57,609 | 21.7 | 303,267 | 20.3 |
| 1973 | 232,179 | 13.4 | 74,599 | 57.6 | 306,778 | 21.7 |
| 1974 | 264,655 | 29.2 | 94,619 | 99.9 | 359,274 | 42.5 |
| 1975 | 257,554 | 25.7 | 104,413 | 120.6 | 361,967 | 43.5 |

Source: 64-201, *Construction in Canada*

From Paul's own company records another table was compiled to show the same type of information for his own company.

more meaningful comparisons between the different years and to identify trends in the operations of his company that were not clear before.

| Roadrunner Construction Company Total Work Performed | | | | | | |
|---|------------------|----------------------|---------------------|----------------------|---------------|----------------------|
| Year | New Construction | | Repair Construction | | Total | |
| | Value (\$000) | Increase from 1971 % | Value (\$000) | Increase from 1971 % | Value (\$000) | Increase from 1971 % |
| 1971 | 615 | | 172 | | 787 | |
| 1972 | 732 | 19.0 | 217 | 26.2 | 949 | 20.6 |
| 1973 | 696 | 13.2 | 270 | 57.0 | 966 | 22.7 |
| 1974 | 729 | 18.5 | 268 | 55.8 | 997 | 26.7 |
| 1975 | 722 | 17.4 | 267 | 55.2 | 989 | 25.7 |

Source: Company records

It was apparent that although the company had experienced a steady increase in the value of total work performed, this increase was far less than the increase in the total activity of highway and bridge construction in British Columbia.

With the figures for 1973 and 1974 restated in 1975 dollars, it was discovered that the decline in gross margin was more serious than had been previously considered.

Adjusting the Financial Statements for Inflation

Costs Compared with the Industry Average

Paul was concerned that inflation could be complicating the interpretation of the figures in his financial statements. For instance, it was difficult to determine if his company was producing profit more or less efficiently from one year to the next when inflation was altering the cost of production and the value of revenue. He wanted to get a general idea of the effect of price increases on his company's markups without having to guess how many of the apparent changes were the result of inflation.

Since it now seemed that his real profits (after considering the effects of inflation) had suffered a serious decline, Paul gave consideration again to his costs as the possible cause or causes of his problem. Hoping to identify which of his cost items might be unusually high by industry standards, he looked for a means to compare his company's costs with those of similar types of businesses. Again, the Statistics Canada Regional Advisor was able to suggest a procedure.

To do this, he decided to calculate his own gross margin figures for 1973 and 1974 in terms of 1975 dollars. The Regional Advisor showed him how price index statistics could be used to do this. Once Paul's figures were restated in terms of 1975 dollars it was possible to make

First, it was necessary to arrange the company's financial data in such a way as to allow ready comparison with the available statistics on industry costs and expenses. For this purpose, the information was arranged in the form of a series of ratios (percentages) based on net operating revenue.

Using the financial statements of the company and data from Statistics Canada, the following table was produced.

Common-Size Income Statement
1975

| | Roadrunner Construction Company % | * Total Firms in same size group in B.C. % |
|--|---|---|
| Operating revenue (net) | 100.0 | 100.0 |
| Direct Operating Costs: | | |
| payment to sub-contractors | 16.0 | 16.8 |
| materials | 8.2 | 7.9 |
| wages | 30.6 | 23.7 |
| repairs to machinery and equipment | 5.3 | 8.0 |
| Total | 60.1 | 56.4 |
| Gross Margin | 39.9 | 43.6 |
| General & Administrative Expenses: | | |
| salaries | 10.5 | 8.3 |
| depreciation | 5.1 | 7.1 |
| other overhead costs | 22.8 | 19.7 |
| repairs to buildings & other structures | — | 0.1 |
| Total | 38.4 | 35.2 |
| Net operating income (before income taxes) | 1.5 | 8.4 |

Sources: Statistics Canada Information Bulletin *Selected Financial and Operational Ratios — Highway, Road, Street and Bridge General Contractors* and the company records

*Note — More current data are now available.

This table compared Paul's income statement with the averages for all firms in the region of a similar size and in the same trade. By expressing each type of cost as a percentage of net operating revenue a series of financial ratios was produced that could be compared to industry averages as available in the published statistics.

Getting to the Source of the Problem

From looking at these ratios, it became apparent that the net operating income was too low compared to the average for the trade. This reconfirmed the earlier finding that gross margin had been declining seriously. The comparison of various cost ratios with those of the industry suggested that costs for wages and salaries had been higher than average and had been at least a major part of the problem leading to lower

profits. This considerably narrowed down the search for solutions so that it was possible to undertake corrective action.

From his own experience Paul deduced that his high wages and salaries probably had been caused by the company having recently undertaken larger and more complex construction jobs. For these jobs, greater numbers of expensive manhours were required in inspection and supervision. The main solution lay in changing the bidding strategy of the company to avoid large and complex jobs and to concentrate on the simple smaller jobs and on repair work.

By comparing the financial ratios of his own firm with industry averages, Paul had been able to assess the competitive position of his company and to focus on those aspects of his operation that most needed to be changed.

Case No. 3 — Escalating a contract

What is an Escalation Clause?

Stefan Bayraski, the owner of a medium-sized electrical contracting firm, was required to prepare an escalation clause in order to bid on a contract.

An escalation clause sets out a formula whereby the price of the contract is adjusted automatically with some or all of the costs of production. It provides the contractor with some protection against inflation by allowing him to submit a bid on the basis of current costs without having to anticipate future changes in his costs for labour and materials. When an escalation clause is written into a contract, it usually specifies particular statistical data from Statistics Canada which are to be used as the basis for adjusting the contract price. Statistics Canada is sometimes consulted in the formulation of these clauses because it is important to the parties concerned to ensure that they have all the necessary information regarding the statistics to be used.

Stefan had no experience with escalation clauses so he approached a Regional Advisor of Statistics Canada to obtain statistical data and also for some general guidance in their use for escalation clauses. The Regional Advisor outlined the important points to be remembered in selecting statistical indexes for this purpose

and, working together, Stefan and the Regional Advisor proceeded to set out a plan for escalating the contract.

To begin with, it was observed that all the significant costs anticipated for the contract could be classified as either labour or materials.

The Costs for Labour

Stefan discussed his anticipated labour costs with the Regional Advisor to determine how these might be escalated with (i.e. adjusted by) appropriate statistics which would reflect the changing cost of labour.

He noted that his work force was composed of basically three groups of employees — supervisors, electricians and apprentices — and that the wages of each group were fixed in relation to the others. By considering the total numbers of each type of employee along with their wage rates and other labour costs, and then by linking this information with published statistics in the form of labour cost indexes, it was possible to set up a system whereby future increases in labour costs would be automatically calculated into the contract price.

Using statistical data on electricians from past years, the Regional Advisor and Stefan prepared the following table to be used in escalating the labour costs for all three types of employees.

Total Labour Cost Movement, Electricians

| | Wage Rate Including Supplements | | Variable-Costs (Wage Rate Including Supplements, less Basic Wage Rate) | | Total Labour Cost | |
|-------|------------------------------------|-------|---|-------|-------------------|-------|
| | \$ | Index | \$ | Index | \$ | Index |
| 1971 | 5.54 | 100.0 | 0.46 | 100.0 | 6.00 | 100.0 |
| 1972 | 6.32 | 114.0 | 0.57 | 123.9 | 6.89 | 114.8 |
| 1973 | 7.21 | 130.0 | 0.75 | 163.0 | 7.96 | 132.7 |
| 1974 | 7.92 | 142.9 | 0.85 | 184.8 | 8.77 | 146.2 |
| 1975 | 9.11 | 164.4 | 0.99 | 215.2 | 10.10 | 168.3 |
| 1976 | 10.65 | 192.3 | 1.21 | 263.0 | 11.86 | 197.7 |
| 1977p | 12.31 | 222.2 | 1.48 | 321.7 | 13.79 | 229.8 |

p: preliminary

The Costs of Materials

Another system was established whereby adjustments in the contract price would be effected automatically in accordance with changes in the costs of materials. The types of materials which would contribute most to the costs for the job determined the particular statistics which were selected to be used to represent material costs in the price adjustment procedure. The materials were all classified as either lighting fixtures, electrical industry equipment, wire and cable, or miscellaneous electrical products.

As more money would be spent on some of these types of materials than on others, it was necessary to establish ratios (expressed as per-

centages) to indicate the proportion represented by each type of material in terms of the total cost that would be incurred for all materials. For example, since it was expected that 10% of the materials cost would be spent on lighting fixtures, this type of material was given the ratio of 10. These ratios, termed weights, were then to become a part of the escalation formula.

By taking the weights for each type of material, along with statistics provided by Statistics Canada giving the price index changes for these materials, it was possible to construct a special index for the change in materials cost affecting the contract.

This table took the form presented below.

Total Material Input Movement

| | Lighting Fixtures | Electrical Ind. Equip. | Wire & Cable | Miscellaneous Elect. Prod. | Total | % Change ¹ |
|----------|----------------------|---------------------------|-----------------|-------------------------------|-------|-----------------------|
| Weights | 10 | 50 | 15 | 25 | 100 | |
| 1971 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | |
| 1972 | 107.1 | 101.9 | 98.9 | 100.5 | 101.6 | 1.6 |
| 1973 | 110.6 | 103.8 | 109.8 | 102.3 | 105.0 | 3.3 |
| 1974 | 120.8 | 125.2 | 137.6 | 123.0 | 126.1 | 20.1 |
| 1975 | 144.2 | 149.2 | 140.8 | 136.3 | 144.2 | 14.4 |
| 1976 | 154.1 | 148.5 | 143.1 | 143.0 | 146.9 | 1.9 |
| 1977p | 167.8 | 153.2 | 148.9 | 152.2 | 153.8 | 4.7 |
| 1976 I | 149.6 | 150.1 | 139.1 | 140.5 | 146.0 | -0.1 |
| II | 154.4 | 148.7 | 142.1 | 142.3 | 146.7 | 0.5 |
| III | 154.2 | 147.4 | 144.9 | 142.8 | 146.6 | -0.1 |
| IV | 158.5 | 148.0 | 146.2 | 146.2 | 148.3 | 1.2 |
| 1977 I | 168.8 | 149.2 | 146.6 | 148.8 | 150.7 | 1.6 |
| II | 167.9 | 151.0 | 152.2 | 153.0 | 153.4 | 1.8 |
| III | 166.2 | 156.1 | 150.0 | 152.4 | 155.3 | 1.2 |
| IV p | 168.2 | 156.8 | 147.0 | 154.7 | 155.9 | 0.4 |
| 1978 I p | 169.7 | 158.4 | 147.8 | 159.9 | 158.3 | 1.5 |

p: preliminary

¹Percentage change from previous period (year or quarter)

To Calculate the Escalated Contract Price

As the final step in organizing the escalation formula, the separate indexes of change for the two major cost items — labour and materials — were combined into a single total index of change that would permit a single adjustment to be made to the original contract price. This would produce the final escalated price.

On the basis of past experience, Stefan estimated that the labour portion would be 45% of his costs for the contract, and that materials would account for the remaining 55%. These two ratios were used as weights in combining the labour and materials indexes into the total input table presented below.

This table was to serve as the means for adjusting the original contract price. As new statistics became available from Statistics Canada over the life of the contract, additional lines could be calculated at the bottom of the table. The percentage change noted in the column at the far right of the bottom line would be used to calculate the final escalated price of the contract.

Suppose, for example, that the percentage change for the Final Weighted Input Table showed that the index had increased by 5% since the signing of the contract. If the price estimated at that time on the basis of current costs had been \$100,000., the escalated price for the contract would be \$105,000. (\$100,000. plus 5% escalation).

Final Weighted Input Movement

| Weights | Labour input | | Material Input | | Total | |
|----------|--------------|-----------------------|----------------|-----------------------|-------|-----------------------|
| | 45 | | 55 | | 100 | |
| | Index | % Change ¹ | Index | % Change ¹ | Index | % Change ¹ |
| 1971 | 100.0 | | 100.0 | | 100.0 | |
| 1972 | 114.8 | 14.8 | 101.6 | 1.6 | 107.5 | 7.5 |
| 1973 | 132.7 | 15.5 | 105.0 | 3.3 | 117.5 | 9.3 |
| 1974 | 146.2 | 10.2 | 126.1 | 20.1 | 135.1 | 15.0 |
| 1975 | 168.3 | 15.2 | 144.2 | 14.4 | 155.0 | 14.7 |
| 1976 | 197.7 | 17.4 | 146.9 | 1.9 | 169.8 | 9.5 |
| 1977p | 229.8 | 16.3 | 153.8 | 4.7 | 188.0 | 10.7 |
| 1976 I | 182.7 | 2.7 | 146.0 | -0.1 | 162.5 | 1.2 |
| II | 195.0 | 6.8 | 146.7 | 0.5 | 168.4 | 3.6 |
| III | 201.2 | 3.2 | 146.6 | -0.1 | 171.2 | 1.7 |
| IV | 212.3 | 5.6 | 148.3 | 1.2 | 177.1 | 3.4 |
| 1977 I | 218.0 | 2.7 | 150.7 | 1.6 | 181.0 | 2.2 |
| II | 229.8 | 5.4 | 153.4 | 1.8 | 187.8 | 3.8 |
| III p | 235.8 | 2.6 | 155.3 | 1.2 | 191.5 | 2.0 |
| IV p | 235.8 | .0 | 155.9 | 0.4 | 191.9 | 0.2 |
| 1978 I p | 235.8 | .0 | 158.3 | 1.5 | 193.2 | 0.7 |

p: preliminary
¹Percentage change from previous period (year or quarter)

Detailed Case Studies

The following section contains ***detailed*** case studies
for the summaries presented
in the preceding section.

Case Study 1.

Case Study 1: Defining and locating a potential market

Henri Coutu was president and owner of St-Vincent-de-Paul (SVP) Renovations Limited, a small contractor specializing in home improvement work. Henri had been operating his business for several years and had been successful in achieving a satisfactory profit level. Over the last year or so, he had noticed a surge of interest in home insulation. Particularly last year, SVP had done a good deal of work in this field, although the necessity to rent equipment in some cases reduced the profitability of such activity compared to SVP's regular lines of work.

Henri knew, of course, that home insulation has become a real concern for many property owners and that the federal government has encouraged homeowners to insulate their dwellings. Thus, this line of activity showed all the signs of becoming a booming business and Henri wanted to investigate the possibilities of making it a major specialty. Some time ago he noticed a newspaper ad and sent for information on the federal government's Home Insulation Program. Reading through the documentation, he noted that, to qualify for subsidies, a house had to be built before 1946, and, that the program would probably be extended to cover houses built after 1946.

Henri had always lived in St-Vincent-de-Paul, now a part of the City of Laval, and most of his business came from within the city. He had seen his community grow over the years and he knew that there were some older houses that would benefit from insulation as a means of reducing the increasing cost of heating. Nevertheless, Henri was not prepared to change the whole orientation of SVP Renovation to concentrate exclusively on this type of activity without obtaining more information. Because of the costs involved in obtaining special equipment, he knew that he needed to have a good estimate of his potential market to assess the

feasibility of such a venture. However, he did not know where to find such information.

One evening, his wife showed him a letter from Statistics Canada informing them that their household had been selected for the monthly Labour Force Survey sample over the next six months. Henri then remembered supplying Statistics Canada with some information on his household when it conducted the 1976 Census of Population. As a matter of fact, he had made a photocopy of his questionnaire and found it in a file in his office. From it, Henri gathered that Statistics Canada might have statistics to answer some of his questions.

Henri called the Montreal office of Statistics Canada and was put in touch with a Regional Advisor. He invited Henri to visit the office to discuss his project more thoroughly and an appointment was set for the next week. When he met the Regional Advisor, Henri first described SVP and explained what had brought him to ask for help from Statistics Canada. He further stated that he did not have the financial resources to expand his operations. So, at least for the time being, he wanted to investigate only the single house market. He also wanted to segment this market into houses built before and after 1946.

The Regional Advisor indicated that the most complete source of information available at the time was the 1971 Census of Canada. Henri wondered whether the data would be timely enough. The Regional Advisor pointed out that the 1971 Census was much more extensive than the 1976 one and that, as a result, it provided much more relevant information.

From a 1971 Census publication on housing characteristics, the following table on occupied dwellings was prepared.

Occupied Dwellings¹
by Tenure and Period of Construction
City of Laval

| Period of Construction | Total ³ | Owned | Rented |
|------------------------|--------------------|--------|--------|
| Before 1946 | 5,325 | 2,740 | 2,595 |
| 1946-1950 | 3,650 | 1,890 | 1,755 |
| 1951-1960 | 19,050 | 13,545 | 5,510 |
| 1961-1965 | 16,685 | 11,990 | 4,695 |
| 1966-1971 ² | 11,910 | 5,855 | 6,055 |
| Total | 56,630 | 36,015 | 20,615 |

Notes: ¹ all types including apartments

² includes the first five months only of 1971

³ totals may not add because of "random rounding". (This system to maintain confidentiality produces numbers ending only in 5 or 0.)

Sources: *Housing, Period of Construction and Length of Occupancy*, 1971 Census of Canada, Catalogue #93-731.

This table revealed a number of important facts to Henri. Regarding periods of construction, it was very clear that when the Home Insulation Program covers the years 1951 to 1965, the workload will be at its peak. Although it could not be assumed that property owners will decide to insulate their dwellings only if and when the program covers the period in which they were built, Henri felt that he could rely on that possibility as a guideline for planning as the availability of government subsidies should have a significant impact.

As to tenure, Henri noted that more than 60 percent of the dwellings in Laval are occupied

by their owners; this he regarded as a plus since the owner is the only person in a position to decide whether or not his house will be further insulated. Although aware that rented dwellings can be further insulated, Henri decided to focus his analysis on the owner-occupied dwellings even if this meant underestimating the potential market. Furthermore, Henri reasoned that most owners tend to live in single dwellings, which by their very nature are easier to work on than high-rise multiple-unit buildings. However, Henri wanted to test this hypothesis and asked the Regional Advisor if he had information combining tenure and type of structure. From another 1971 Census publication, the Advisor gathered the following data, again for the City of Laval.

Occupied Dwellings¹ by
Type and Tenure, 1971
City of Laval

| Type | Total ² | Owned | Rented |
|------------------|--------------------|--------|--------|
| Single detached | 32,865 | 29,905 | 2,965 |
| Single attached | 7,030 | 3,160 | 3,870 |
| Sub-total | 39,895 | 33,065 | 6,835 |
| Duplex | 7,635 | 2,265 | 5,370 |
| Apartment, Other | 8,935 | 515 | 8,420 |
| Total | 56,465 | 35,845 | 20,625 |

Notes: ¹ Totals exclude mobile homes

² Totals may not add, because of "random rounding".

Source: *Housing, Dwellings by Tenure and by Structural Type*, 1971 Census of Canada, Catalogue #93-727.

This table supported Henri's approach since it clearly indicated that those dwellings defined as "single" are mostly owner-occupied. In fact, 92% of the owner-occupied dwellings are single houses and such owner-occupied single dwellings account for over 58% of all dwellings in Laval.

Henri knew that Laval is a very large city with a land area of 94.8¹ square miles — over one and a half times the 61.0 square miles of the City of Montreal (see map 1). However, its population density is less than one eighth that of its neighbour with 2,406.4¹ persons per square mile against the 19,917.2 persons per square mile for Montreal. This meant that Henri's prime market, that is, owner-occupied single dwellings built before 1946, might be scattered all over the city, and he wanted to determine if such was the case.

The Regional Advisor indicated to Henri that municipalities in large population concentrations such as the Montreal Census Metropolitan Area, of which Laval is a part, are divided into smaller areas called Census Tracts² (C.T.) on which much information is available. This information for Laval is published in two complementary bulletins³, each with a map outlining the tracts' boundaries (see map 2).

The first publication (series A) indicates the type and tenure of all occupied dwellings. From the second publication (series B), it is possible to access the age bracket of all dwellings, as these are presented by selected periods of construction. Unfortunately, this information was

not presented in the way Henri preferred. Ideally, he should have had a table showing the number of owner-occupied single houses (single detached and single attached) by periods of construction for each census tract in Laval.

The Regional Advisor explained that, even though such a tabulation was not published, this did not mean that it could not be produced. In fact, special customer tabulations⁴ as well as unpublished but readily prepared cross-tabulations, can be produced at a minimal cost in Ottawa.

The Montreal reference centre had some unpublished but readily available studies from the 1971 Census. Of particular interest to Henri was the one showing, by census tracts in Laval, the number of owner-occupied dwellings by periods of construction.

Although single-house information was missing, Henri felt that, since 92 percent (see second table) of the owner-occupied dwellings are single houses, this special table was sufficient to derive an estimate of the market as well as its location.

The distribution of the 38 census tracts showed much variability in the owner-occupied dwellings and Henri suggested that a possible cut-off line could very well be 50 dwellings per census tract. The following table presents these areas of concentration that Henri transcribed on to his map.

Notes ¹ *Geography, Land Areas and Densities of Statistical Units, 1971 Census of Canada, Special Bulletin Catalogue #98-701*

² Census Tracts are small statistical areas within major urban centres (Census Metropolitan Areas) which follow easily recognized boundaries, contain between 2,500 and 8,000 people and are fairly homogeneous in terms of economic and social factors.

³ *Population and Housing Characteristics by Census Tracts, Montreal, series A and B, Catalogue #95-704 and 95-734*

⁴ The cost of a special tabulation depends on the size of the geographical area and the number of cross tabulations requested.

Owner-occupied Dwelling
by Selected Periods of Construction
and Census Tracts, Laval

| Census tracts | All periods | Before 1946 | 1946-1950 |
|---------------|-------------|-------------|-----------|
| 627 | 960 | 125 | 55 |
| 631 | 120 | 55 | |
| 632 | 1,610 | 80 | |
| 635 | 875 | 165 | 190 |
| 638 | 1,665 | | 65 |
| 639 | 515 | | 70 |
| 640 | 650 | 85 | 55 |
| 641 | 1,110 | 50 | |
| 646 | 970 | 125 | 100 |
| 647 | 580 | 75 | 80 |
| 650 | 1,605 | 85 | 50 |
| 652 | 1,935 | 175 | 105 |
| 653 | 255 | 75 | 55 |
| 654 | 130 | 60 | |
| 655 | 1,315 | 400 | 250 |
| 656 | 875 | 85 | 115 |
| 658 | 1,505 | 55 | 50 |
| 659 | 1,375 | 360 | 145 |
| 661 | 1,280 | 115 | 95 |
| 662 | 540 | 75 | |
| Total | 19,870 | 2,245 | 1,480 |
| Laval | 36,015 | 2,740 | 1,890 |

With this information, Henri was able to assess the size of the market and he was able to almost pinpoint the areas where demands for insulation were likely to come from. He also knew that the number of houses built between

1951 and 1971 constituted a market large enough to provide work for several years, since almost nine out of 10 owner-occupied dwellings were built during that period.

Map 1

Laval and City of Montreal



Map 2

Laval by Census Tracts



Case Study 2.

Case Study 2: A Contractor Assesses His Competitive Position

Roadrunner Construction Company was a general contractor specializing in highway, road, street and bridge construction. The company was located in Prince George and did most of its work within British Columbia. The company was small even though it had existed for 20 years and had established a reputation for technical know-how and high-quality workmanship. Roadrunner Construction Company bid on numerous invitations to tender for work required in the province and had succeeded, until recently, in maintaining its share of the local construction market.

In recent years, however, the company added a higher markup due to a substantial increase in operating costs. This action resulted in uncompetitive bids being submitted. Mr. Paul Even, the owner of the company, was con-

cerned because competitors were obtaining more than their usual share of contracts and he felt that something had to be done to correct the situation.

Mr. Even's first thought was to reduce his overall markup to regain his competitive position and retain most of his business. He believed that, if he lowered his prices sufficiently, he could increase his work volume. However, his experience reminded him that he should investigate the situation more closely before making such a drastic decision.

To start his investigation, Mr. Even compiled a set of figures on the operating profits of his company for a period of five years, as set out in Table 1.

Table 1

Comparative Operating Revenue & Net Operating Profits
Calendar Years, 1971-75

| Item | 1971 | 1972 | 1973 | 1974 | 1975 |
|---|---------|---------|---------|---------|---------|
| | \$ | \$ | \$ | \$ | \$ |
| Net operating revenue | 620,110 | 747,852 | 762,753 | 888,862 | 823,475 |
| Gross margin | 235,642 | 287,923 | 297,474 | 355,545 | 328,566 |
| Net operating profits before taxes | 14,882 | 21,688 | 22,882 | 24,888 | 12,352 |
| Net operating profit as % of net operating revenue | 2.4% | 2.9% | 3.0% | 2.8% | 1.5% |

Source: Company records

In spite of the company's efforts to achieve a higher markup, the net operating profits as a percentage of net operating revenue declined in the 1974 and 1975 fiscal years. The situation for 1975 was of particular concern.

The intense inflationary pressure also alarmed him. He worried about the ever-increasing prices he had to pay for his business needs. Mr. Even also worried about his company's rate of growth by comparison with those of other contractors in his province. To satisfy his curiosity, he knew he should obtain relevant statistics for his investigation.

Mr. Even recalled that, from time to time, he had had to complete questionnaires for Statistics Canada. This led him to wonder whether

Statistics Canada had some data to help him assess his competitive position. Since he was in Vancouver on other business, he made a point of visiting the local office where he was directed to the reference centre.

Mr. Even described what he was looking for, and he was shown the following publications:

1. 64-201/ *Construction in Canada*
Provides data on value of new and repair work performed, by type of structure for various industries, for both Canada and the provinces.
2. 64-206/ *The Highway, Road, Street and Bridge Contracting Industry*

Features data on value of work performed and type of construction, by size groups for Canada and by provinces. Selected balance sheet information and a series of financial ratios are also presented.

3. Information Bulletin/ *Selected Financial and Operational Ratios — Highway, Road, Street and Bridge General Contractors*

Data include financial ratios by size groups; revenues, costs, profit and loss expressed as percentages of total operating revenue by size groups, Canada and regions.

4. 62-008/ *Construction Price Statistics, Quarterly Report*

Contains detailed price indexes of inputs into construction, contractors selling prices and special purpose aggregations of price indexes for construction and machinery and equipment relating to

specified categories of capital expenditure.

5. Uncatalogued/ *Financial Performance, Selected Mechanical Contractors in British Columbia, 1969-1973*

This paper, written by Vern Totten of Statistics Canada's Construction Division, appeared in the September 1975 issue of the B.C. trade publication *Mechanical Contractor*.

With these publications and some of his own company's records, Mr. Even proceeded to examine several aspects of his competitive position. First of all, he was interested in finding out about his company's growth rate in comparison to other contractors in B.C. With the data available from several issues of the publication *Construction in Canada* and from his own records, Mr. Even made the following analyses. (see Tables 2 & 2a).

Table 2

Highway, Road, Street and Bridge Construction
Total Work Performed in B.C.

| Year | New Construction | | Repair Construction | | Total | |
|------|-------------------|----------------------------|---------------------|----------------------------|-------------------|----------------------------|
| | Value (\$'000) | Increase from 1971 % | Value (\$'000) | Increase from 1971 % | Value (\$'000) | Increase from 1971 % |
| 1971 | 204,813 | | 47,341 | | 252,154 | |
| 1972 | 245,658 | 19.9 | 57,609 | 21.7 | 303,267 | 20.3 |
| 1973 | 232,179 | 13.4 | 74,599 | 57.6 | 306,778 | 21.7 |
| 1974 | 264,655 | 29.2 | 94,619 | 99.9 | 359,274 | 42.5 |
| 1975 | 257,554 | 25.7 | 104,413 | 120.6 | 361,967 | 43.5 |

Source: 64-201, *Construction in Canada*

Table 2a

Roadrunner Construction Company
Total Work Performed

| Year | New Construction | | Repair Construction | | Total | |
|------|-------------------|----------------------------|---------------------|----------------------------|-------------------|----------------------------|
| | Value (\$'000) | Increase from 1971 % | Value (\$'000) | Increase from 1971 % | Value (\$'000) | Increase from 1971 % |
| 1971 | 615 | | 172 | | 787 | |
| 1972 | 732 | 19.0 | 217 | 26.2 | 949 | 20.6 |
| 1973 | 696 | 13.2 | 270 | 57.0 | 966 | 22.7 |
| 1974 | 729 | 18.5 | 268 | 55.8 | 997 | 26.7 |
| 1975 | 722 | 17.4 | 267 | 55.2 | 989 | 25.7 |

Source: Company records

It was apparent that, before 1973, total work performed by the company was increasing at a slightly higher rate than that of the industry in B.C. However, the company suffered a serious setback during 1974 and 1975 and, as a result, the percentage rate of growth in terms of total value of work performed for both new construction and repairs was falling far behind the percentage rate of growth of the trade as a whole.

Since Mr. Even worried about the problem of inflation, he wanted to get a general idea of the effect of price increases on the company's markups for various key items such as cost of machinery and equipment, materials and labour, in the measurement of job costs. He therefore extracted the necessary data from publication #62-008, entitled *Construction Price Statistics*, and produced Table 3.

Table 3

Construction Price Indexes
1971 = 100

| | 1973 | 1974 | 1975 |
|---|-------|-------|-------|
| Highway construction selling price in B.C. | 101.6 | 170.2 | 183.2 |
| Highway construction contract work price index in B.C. | 100.6 | 169.5 | 181.4 |
| Highway, road, street and bridge construction building materials composite in Canada (see Table 3a)* | 112.1 | 143.4 | 171.0 |
| Union wage rate including supplements in Vancouver (average) | 116.8 | 133.0 | 157.9 |
| Construction machinery & equip- ment price index in Canada | 106.0 | 120.0 | 148.4 |

Sources: 62-008, *Construction Price Statistics* and Table 3a

* Recompiled by Mr. Even to reflect his own company's experience of types and amounts of materials used.

These price statistics indicated that in 1975 a contractor in Canada would have to spend about \$148.40 for the same piece of equipment that could be obtained for \$120.00 in 1974 and for \$106.00 in 1973. In the same table, other key items such as the highway construction contract

work price index, the union wage rate index for major construction trades, and the special highway, road, street and bridge construction material price index that Mr. Even compiled (see Table 3A for details) reflected a similar pattern.

Table 3a
Highway, Road, Street & Bridge Construction
Selected Building Materials Price Indexes
1971 = 100

| | Relative Importance or Weight | 1973 | Price Index 1974 | 1975 |
|---|----------------------------------|---------|---------------------|---------|
| Primary metal | 1 | 117.5 | 147.7 | 160.8 |
| Iron and steel mills | 1 | 110.4 | 136.3 | 162.0 |
| Bars, concrete reinforcing | 1 | 114.9 | 177.2 | 196.0 |
| Structural steel shapes, beams wide, flanged unfabricated, heavy | 1 | 112.1 | 128.0 | 154.5 |
| Structural shapes, unfabricated, heavy | 1 | 112.2 | 143.9 | 162.3 |
| Steel pipe & tube mills | 1 | 111.5 | 132.0 | 162.9 |
| Cement manufacturers | 2 | 107.6 | 122.2 | 146.3 |
| | | 107.6 | 122.2 | 146.3 |
| Sewer pipe, reinforced | 1 | 108.5 | 136.1 | 168.1 |
| Concrete, ready-mixed | 2 | 110.4 | 122.3 | 153.2 |
| | | 110.4 | 122.3 | 153.2 |
| Asphalt | 2 | 117.4 | 187.1 | 228.6 |
| | | 117.4 | 187.1 | 228.6 |
| | 13 | 1,457.9 | 1,864.4 | 2,222.8 |
| Roadrunner's Weighted Price Index | | 112.1 | 143.4 | 171.0 |

Sources: 62-008, *Construction Price Statistics* and the weight based on company records

Mr. Even found that he had to exercise considerable judgement to choose the appropriate price indexes for his investigation. For instance, the price index of machinery and equipment for B.C. was not available, so he used the construction machinery and equipment price index in Canada as a substitute. For the measurement of his company's labour content, he used the union wage rate index for an average of 16 construction trades in Vancouver that he thought would be more indicative of the wage rate for B.C. than the national index.

For the construction material price index, Mr. Even selected the key items required for his business. He also realized that when performing a job, the required quantities of several types of materials might not be the same as in the total index and therefore all items shown in table 3A were weighted on the basis of quantities required by the company to complete most of its jobs. For instance, more cement and asphalt and ready-mixed concrete are normally used; therefore, these items carried heavier weights than other items in the table.

With these price indexes, Mr. Even began to analyse the effect of the shrinking value of the dollar on the company's markups on various key items. While preparing Table 4, he was fully aware that the use of annual price indexes as the basis for his adjustment of the company's records might be a bit crude. This was because of the different timing of his various contracts during the year. However, he felt that shortcuts to the restatement of Cost of Sales would not produce results differing significantly enough from results derived by detailed computation to

warrant the additional effort. The rough figures were good enough to visualize the trend in the company's gross margin.

Table 4 revealed that the company's gross margin restated in terms of 1975 dollars has been declining since 1973. The figures suggested that the gross margin of \$297,474 earned in 1973 was worth \$677,559 in terms of 1975 dollars while the gross margin of \$355,545 earned in 1974 was equivalent to \$336,770 in 1975 dollars.

Table 4
Roadrunner Construction Company
Comparative Revenue, Cost of Sales and Gross Margin
12 Months Ended December 31

| | Unadjusted Book Figures In Current Year Dollars | | | Restated in Terms of 1975 Dollars | | |
|------------------------------|--|-----------|-----------|--------------------------------------|-----------|-------------|
| | 1975 | 1974 | 1973 | 1975 | 1974** | 1973** |
| Operating revenue (net) | \$823,475 | \$888,862 | \$762,753 | \$823,475 | \$956,416 | \$1,375,244 |
| Cost of sales* | | | | | | |
| Payments to subcontractors | 131,756 | 142,917 | 120,413 | 131,756 | 152,921 | 217,105 |
| Materials | 67,525 | 71,109 | 59,206 | 67,525 | 84,762 | 90,289 |
| Wages | 251,983 | 260,000 | 200,688 | 251,983 | 308,620 | 271,330 |
| Repairs (machinery & equip.) | 43,645 | 59,291 | 84,972 | 43,645 | 73,343 | 118,961 |
| Total | \$494,909 | \$533,317 | \$465,279 | \$494,909 | \$619,646 | \$697,685 |
| Gross Margin | \$328,566 | \$355,545 | \$297,474 | \$328,566 | \$336,770 | \$677,559 |

* Taking into account work in progress at beginning and year-end inventory adjustments
 **Unadjusted book figure in current year dollars multiplied by the corresponding conversion factor shown in Table 4a. For example, in the case of operating revenue: \$888,862 X 1.076 = \$956,416 for 1974 and \$762,753 X 1.803 = \$1,375,244 for 1973

Table 4a
Conversion Factor to 1975 Dollars

| | 1974 | 1973 |
|--|-------|-------|
| Highway construction selling price in B.C. | 1.076 | 1.803 |
| Highway construction contract work price index in B.C. | 1.070 | 1.803 |
| Highway, road, street and bridge building material | 1.192 | 1.525 |
| Union wage rate | 1.187 | 1.352 |
| Construction machinery & equipment | 1.237 | 1.400 |

Source: Table 3
 To compute the conversion factor for restatement to 1975 dollars, divide the index number for 1975 by each of the other index numbers shown in Table 3. For example, in the case of highway construction selling price: $183.2 \div 101.6 = 1.803$ for 1973 and $183.2 \div 170.2 = 1.076$ for 1974.

Although the book figures expressed in current year dollars indicated that a decline in gross profits had occurred only in 1975, Mr. Even discovered that the overall gross margin of his company was not as rosy as he had thought.

Mr. Even then decided to compare the common-size income statement of Roadrunner to those of comparable-size firms within the same industry.

A common-size income statement ex-

presses the components as a percentage of net operating revenue (or net sales). This statement shows the percentages of net operating revenue that have been absorbed by each individual cost or expense item. The percentage that remains is net operating income (before income taxes). A comparison of Roadrunner's figures, item by item, with the costs of other companies would assist Mr. Even in identifying those that were responsible for reducing his profits. (See Table 5).

Table 5

Common-Size Income Statement
1975

| | Roadrunner Construction Company % | Total Firms in same size group in B.C. % |
|---|---|---|
| Operating revenue (net) | 100.0 | 100.0 |
| Direct Operating Costs: | | |
| payment to sub-contractors | 16.0 | 16.8 |
| materials | 8.2 | 7.9 |
| wages | 30.6 | 23.7 |
| repairs to machinery and equipment | 5.3 | 8.0 |
| Total | 60.1 | 56.4 |
| Gross Margin | 39.9 | 43.6 |
| General & Administrative Expenses | | |
| salaries | 10.5 | 8.3 |
| depreciation | 5.1 | 7.1 |
| other overhead costs | 22.8 | 19.7 |
| repairs to building & other structures | — | 0.1 |
| Total | 38.4 | 35.2 |
| Net operating income (before income taxes) | 1.5 | 8.4 |

Sources: Statistics Canada Information Bulletin *Selected Financial and Operational Ratios — Highway, Road, Street and Bridge General Contractors* and the company records

From Table 5 it was obvious that the net operating income of Roadrunner was far too low compared to those of its competitors of comparable size in B.C. In 1975 the net operating income of Roadrunner was only 1.5 cents of the operating revenue dollar, while other firms in the same-size group produced net earnings of 8.4 cents of each operating revenue dollar. The comparative figures of Roadrunner and of the industry in general indicate that lower profits of the company seemed to be brought about by accelerating costs: exceptionally high costs for the company were most visible in wages, salaries, and other overhead costs. Industry averages indicated that wages for general contractors of the same size as Roadrunner were 23.7% of operating revenue and salary costs 8.3%, while the overhead costs were as low as 19.7%.

Mr. Even suspected that higher than industry average salaries and other overhead costs were mainly attributable to increasing manpower and other resources spent on preparing bids for submission. Mr. Even also discovered that, as a result of the existing high ratio of unsuccessful bids, much time and effort of his staff was often non-productive. Nevertheless, Mr. Even was still puzzled by the high labour costs of his company since most of the competing contractors could also be expected to encounter roughly the same costs in performing similar work.

The other companies all based their bids on the same contract specification, used the same types of equipment, obtained supplies and materials from the same sources, and tapped the same labour supply. Wage rates for all tradesmen were in fact governed by the same union contracts. What, then, accounted for Roadrunner's excessive labour costs?

Mr. Even then recalled that in recent years several large projects his company had under-

taken took longer to complete than originally planned. As a matter of fact, on numerous occasions, he had to approach his customers for more time. The manhours used on these projects far exceeded the original budgets. Other significant problems that Roadrunner faced as a result of extending time on projects were (1) additional increase of union wage rates; after one year, union wage rates increased, yet the selling prices agreed to by the company could not increase as they were firm for the length of the contract; and (2) too much money was tied up in work-in-process inventory; as a result, Mr. Even had injected a fair amount of additional capital in his company.

Typically, one of the critical areas of Roadrunner's operations was on-site inspection and supervision. As a matter of fact, all large projects required close supervision to ensure efficiency. The larger projects were technically complex, so frequent on-site inspection by key personnel of the company was required. In recent years, as a result of substantial increases in the number of bids, technical instruction related to how a job was to be done, as well as operational supervision related to how quickly it was done, had been lagging far behind.

Mr. Even decided that it was time to change the bidding strategy of the company. In fact, not all jobs were equally profitable to the company, depending upon the availability of special equipment and skilled personnel. Instead of submitting bids for all tender invitations in the province, perhaps the company should be much more selective. It might be better for the company to undertake smaller jobs and to aim at an increase in its share of repair construction rather than compete for larger contracts with lower markups.

Case Study 3.

Case Study 3: Escalating a Contract

Stefan Bayraski was the president and principal shareholder in J.A. Bayraski Electrical Works of Winnipeg, a medium-sized electrical contracting firm specializing in non-residential building construction. When Stefan took over the business from his father some years ago, the firm was almost exclusively involved in residential construction, both new and repair. Stefan realized that this was a volatile market with a number of small entrepreneurs and general contractors falling by the wayside every year and new ones entering the field. As a result, a specialized sub-contractor such as J.A. Bayraski had to spend much time soliciting new business and had to keep in mind the possible bankruptcy of such entrepreneurs.

Without totally abandoning this field, Stefan began to seek out the larger, more stable source of business he associated with non-residential building construction, as a way of increasing the firm's financial security and providing steadier work for his employees. His decision proved to be sound, so much so that the firm quadrupled in size and was now called upon by a number of general contractors to act as electrical contractor in projects all over the province. As a result, J.A. Bayraski Electrical Works was now almost totally out of residential construction except for the occasional large apartment project.

When Manitoba Hydro issued a call for tender on a hydro-electric generating project in north-eastern Manitoba, one general contractor for whom J.A. Bayraski had done a lot of work in recent years decided to submit a bid. The contractor approached Stefan and asked him to submit a bid on the electrical part of the work. Stefan was hesitant because he had no experience in hydro-electric work and knew it would mortgage an important part of his resources over a long period. However, it would also open a whole new field of experience for his firm and the financial rewards could be most attractive if new capital expenditures could be kept to a minimum. Otherwise, J.A. Bayraski would need a sizeable influx of capital to buy materials and transportation equipment. Stefan did not want to significantly increase his debt-to-equity ratio.

Stefan discussed these considerations with the general contractor who told him that other possible sub-contractors had also brought up the transportation problem. As a result, he began discussions with a number of transporta-

tion companies to award a contract for the transport of all material and labour to the site, arguing that such an arrangement would drastically reduce his "front-end" expenditures. As to materials, the general contractor pointed out that the supply and installation of heavy components such as turbines and generators require highly specialized manpower and that this type of work would be done by Manitoba Hydro or their designated specialists. J.A. Bayraski's work would thus involve wiring and lighting for the whole project, as well as the installation of various kinds of electrical equipment such as transformers, switchgear and control equipment.

The contractor gave Stefan the specifications for the job so that he could determine a price. In view of the duration of the project, the contractor asked Stefan to establish this price as if he would be doing all his work in the coming weeks. He explained that this "current price" would serve as a reference point only, since he also wanted Stefan to prepare an escalation clause to be included in their contract. This clause would protect J.A. Bayraski against inflation and would also be included in his own bid to Manitoba Hydro. He recommended that Stefan contact the provincial government's central statistics agency for assistance. After discussing the problem, an official of the Manitoba Bureau of Statistics suggested Stefan might wish to deal with the Regional Advisor in the Statistics Canada office in Winnipeg, since the clause should be based on price indexes produced by Statistics Canada.

At his meeting with the Regional Advisor, Stefan outlined the purpose of his visit and gave him a copy of the draft bid he had prepared. He explained that it was the first time he had ever been asked to include an escalation clause in a contract and he would like some background information as well as explanations and advice on the price indexes he should use.

The Regional Advisor explained that an escalation clause makes it unnecessary to estimate the final contract price. Instead, the company can bid on the basis of current costs and then set out in the contract a formula for increasing this price in line with increases in costs generally experienced by the industry, such increases being measured by published

statistics. Obviously, the time and effort required to build an escalation clause are justified only by long term contracts and if the clause applies to the major cost elements in the contract.

The Regional Advisor then gave Stefan a copy of a three-page document, *Escalation of Industrial Contracts* prepared by the Prices Division of Statistics Canada. This document includes a number of suggestions and warnings on the process of contract escalation and outlines the services available from the division in that area. He also supplied Stefan with a one-page document *Guidelines for Price Escalation* that outlines a number of rules to be observed when preparing a price escalation clause.

The Regional Advisor went over the eight points outlined on this sheet and explained them carefully to Stefan, using his current situation as a case in point. These points were as follows:

- a) Usually, escalation clauses take account of only the most important material and labour inputs.
- b) Historical changes in the indexes chosen should roughly parallel the firm's history of price changes for inputs.
- c) Where the most closely related index does not correspond exactly to the item to be escalated, more general indexes should be investigated to see if their historical pattern of change more closely follows the company's experience.
- d) Where a special index is compiled, the weights (relative importance) to be given to each component to be escalated (e.g., material, labour) must be determined.
- e) The contract should be written so that revisions to the indexes can be accommodated without invalidating the escalation clause.
- f) It is imperative to use percentage changes and not index point changes, since percentage changes are not affected by a change in the base year.

- g) The Prices Division of Statistics Canada should be asked about the indexes chosen for use in an escalation clause to ensure that it will be possible to maintain comparable indexes over the life of the contract.

- h) It is necessary to fully understand the characteristics, methodology and limitations of the data before incorporating them in an escalation clause.

Stefan could include items for each of materials in his escalation clause, if he felt that each group represented an important enough expenditure element to be included. However, Stefan told the Advisor that the cost of cutting tools and hand tools has always been marginal in his overall expenditures and operating costs and they decided to leave it out. As a result, the only two input elements to be escalated were the labour and the material inputs (point a).

The Regional Advisor asked Stefan how his labour input would be made up. Stefan explained that he intended to set up teams, the way he did on other construction projects and that such teams were usually made up of one apprentice for every two qualified electricians, with a further employee in a supervisory-management capacity to every three teams. The Regional Advisor said that such information would help to determine the weight of each labour component in his total labour index (point d). Furthermore, it would be used to determine which indexes should be looked at in building this total labour index. In fact, the Regional Advisor presented Stefan with three publications, a monthly entitled *Employment, Earnings and Hours* that includes weekly earnings figures in the construction industry by type for both Manitoba and Winnipeg; and two other publications, a monthly and a quarterly, both entitled *Construction Price Statistics*, with tables on "Union Wage Rate Indexes" for major construction trades, including electricians, and for major cities, including Winnipeg. The first publication provides figures obtained from companies with 20 or more employees, usually covering the last pay period of the month; no data were available on an occupational basis. The last two contain figures derived mainly from the *Construction Collective Agreement Survey Service* provided by the Canadian Construction Association.

Although only the indexes are provided in these publications, actual wage rates for each trade in those cities can be retrieved from CANSIM®, the Statistics Canada machine readable data base.

In view of the particular mix of the J.A. Bayraski employment structure, Stefan felt that this occupational breakdown, even though only available on a city basis, was preferable to an all inclusive figure for the industry. Further, since his labour force was unionized, the Canadian Construction Association data should reflect his labour cost well.

They went through the list of 16 trades and noted that electricians are listed, but not apprentices or supervisors. Stefan explained to the Regional Advisor that while an apprentice was paid on average half the wage and fringe benefits of a qualified electrician, he paid a supervisor 15 percent more than a qualified

electrician. The Regional Advisor added that, under such circumstances, they could use the index for electricians, since the wage and benefit structure for all three groups would move in a similar, parallel fashion (point b).

The last question they had to solve before establishing a table of the labour input had to do with the data series they would use. They had a choice between an index of the basic wage rate only, and one that also included some fixed-costs supplements to this basic rate. The Advisor pointed out that while the first only takes account of the gross pay rate of the employee, the second further comprises a number of costs that he as an employer must assume, benefits such as vacation pay, statutory holiday pay, employer's contribution to private pension plan and to health and welfare plans among others, all of which are part of his employment expenditures. Using CANSIM, the Regional Advisor produced an abbreviated table comparing both series for electricians.

Table 1
Union Wage Rate and Union Rate Indexes, Electricians

| | Basic Wage Rate | | Wage Rate including Supplements | |
|-------|-----------------|-------|---------------------------------|-------|
| | \$ | Index | \$ | Index |
| 1971 | 5.08 | 100.0 | 5.54 | 100.0 |
| 1972 | 5.75 | 113.1 | 6.32 | 114.0 |
| 1973 | 6.46 | 127.0 | 7.21 | 130.0 |
| 1974 | 7.07 | 139.2 | 7.92 | 142.9 |
| 1975 | 8.12 | 159.7 | 9.11 | 164.4 |
| 1976 | 9.44 | 185.7 | 10.65 | 192.3 |
| 1977p | 10.83 | 213.2 | 12.31 | 222.2 |

p: preliminary

As this table shows, an employer who indexed a contract on the basic wage rate while still having to meet the faster rising expenditures of those supplements would not have been totally protected against rising employment expenditures over the 1971-77 period.

Stefan asked the Regional Advisor if those supplements included all types of added

expenditures, including unemployment insurance and workmen's compensation. The Advisor replied that the labour cost was actually broken down into two components: fixed-costs stated in contracts as cents-per-hour items or as a percentage of the basic wage rate; and variable-costs that can only be determined after the work is done because the size of the charge depends on such things as annual earnings, or

amount of overtime, or type of project. This variable-cost component includes contractual items such as overtime rates of pay, room and board allowances, travel allowances, premium pay and bonuses as well as legislated items such as Canada Pension Plan, workmen's compensation and unemployment insurance.

The supplements in Table 1 include only the fixed-cost components. The Regional Advisor provided Stefan with photocopies of a special explanatory bulletin on these "Construction Union Wage Rates and Indexes" that had been included in a past issue of the monthly *Construction Price Statistics*; this bulletin details the concepts and methodology used (point g).

Stefan was somewhat dismayed at this as he knew he would have to face a number of these variable-cost items and he wanted to be protected against increases. The Regional Advisor explained to him that a specific clause

covering such expense items, and allowing for revisions based on cost actually encountered, could be included in the contract. However, such elements would still need to be taken into consideration in determining the base price in the contract, so Stefan needed to have some idea of the current costs of such elements. Stefan pointed out that travel would be provided free by the general contractor and would not be part of his variable costs. Room and board presented a particular problem since, although the general contractor would supply those, he would bill the subcontractors. However, Stefan was confident that such costs would not increase faster than other variable-cost items. Those items, he estimated, would reach the same level as the fixed-cost items once the basic wage rate was removed from this group. Using the figures in the first table, Stefan and the Regional Advisor produced a second table to reflect Stefan's total labour cost and its movement through time.

Table 2
Total Labour Cost Movement, Electricians

| | Wage Rate Including Supplements | | Variable-Costs (Wage Rate Including Supplements; less Basic Wage Rate) | | Total Labour Cost | |
|-------|------------------------------------|-------|---|-------|-------------------|-------|
| | \$ | Index | \$ | Index | \$ | Index |
| 1971 | 5.54 | 100.0 | 0.46 | 100.0 | 6.00 | 100.0 |
| 1972 | 6.32 | 114.0 | 0.57 | 123.9 | 6.89 | 114.8 |
| 1973 | 7.21 | 130.0 | 0.75 | 163.0 | 7.96 | 132.7 |
| 1974 | 7.92 | 142.9 | 0.85 | 184.8 | 8.77 | 146.2 |
| 1975 | 9.11 | 164.4 | 0.99 | 215.2 | 10.10 | 168.3 |
| 1976 | 10.65 | 192.3 | 1.21 | 263.0 | 11.86 | 197.7 |
| 1977p | 12.31 | 222.2 | 1.48 | 321.7 | 13.79 | 229.8 |

p: preliminary

This table showed Stefan that during the last few years his total labour cost for electricians had increased somewhat faster than their wage rate, including supplements over the same period. This reflected a faster increase in fringe benefits than in the basic wage rate. Stefan was not surprised as he knew that some new benefits had been introduced during the last years, while the cost of older ones such as unemployment insurance had risen somewhat.

So, to protect himself fully, Stefan would need to index his labour input to a total labour cost index.

Once they had managed to define a suitable labour cost index, Stefan and the Regional Advisor could build their final weighted labour input index. They went back to CANSIM and gathered all the data they needed, i.e., a series of hourly wage rates and wage rate

indexes for electricians. These data are available on a monthly basis, but since Stefan and the general contractor had agreed to a quarterly escalation clause, they calculated quarterly averages and computed the percentage changes between those averages. The Regional Advisor explained that the use of such a quarterly average index, besides sparing the parties the trouble of monitoring indexes every month, is also recommended as its longer time-span renders it less subject to the erratic behaviour that occasionally shows up in monthly indexes, particularly material indexes.

The final step in building this weighted labour input index was to determine the respective weights of each component. Stefan indicated earlier that a full team was composed of six electricians, three apprentices and a supervisor; however, the Advisor cautioned that these figures could only be used as weights in Stefan's labour expenditures if all his employees were paid the same, which was not the case. In fact, even if such a team was composed of only three employees, an electrician, an apprentice and a supervisor, each of them would not carry the same weight in the total labour cost because, as Stefan indicated previously, the wage and benefits of an electrician amounted to twice those of an apprentice and were somewhat smaller ($100 \div 115 = 87\%$) than those of a supervisor. Therefore, the relative importance of each trade in the team would be a function not only of the number of individuals from each trade but also of the labour cost of each. To derive a final weighting pattern, they would multiply the number of individuals in each trade with the labour cost for each and add the results to arrive at a total labour cost. They would then divide these labour costs for each trade by the total labour cost to obtain the weights that would reflect the relative importance of each trade in the total labour cost.

If the cost movement of the three trades was different, such weights would then be used to produce a final table on labour input. In it, the total would be expressed in the form of an index

from which the percentage change would be calculated. However, in this case, since the two other trades had been defined in relation to an electrician, this was unnecessary since their movement would be the same. So Stefan was able to use his electrician's total labour cost index as his total labour input index in the labour portion of his escalation clause.

Next, Stefan and the Regional Advisor looked at the other element in the escalation clause — materials. Basically they repeated the same process by defining the products to be used and determining the weight of each index in the total material input from Stefan's experience. They matched their list of products with those included in various indexes. Stefan selected four indexes within the electrical products industries group in the table entitled "Industry Selling Price Indexes by Major Groups, Industries and Selected Commodities", contained in the monthly publication *Industry Price Indexes*. These indexes are:

- Manufacturers of lighting fixtures (16 3330) for 10% of his material input.
- Manufacturers of electrical industrial equipment (16 3360), 50% of his material input.
- Manufacturers of electric wire and cable (16 3380), 15% of his material input.
- Manufacturers of miscellaneous electrical products, N.E.S. (16 3399), 25% of his material input.

The Regional Advisor used CANSIM once more to retrieve the latest monthly information and they calculated the quarterly averages of these monthly indexes, the last six months of which were subject to revisions.

They then used this information to prepare a table on material input expressed as an index and the percentage change of it.

Table 3

Total Material Input Movement

| | Lighting Fixtures | Electrical Ind. Equip. | Wire & Cable | Miscellaneous Elect. Prod. | Total | % Change ¹ |
|----------|----------------------|---------------------------|-----------------|-------------------------------|-------|-----------------------|
| Weights | 10 | 50 | 15 | 25 | 100 | |
| 1971 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | |
| 1972 | 107.1 | 101.9 | 98.9 | 100.5 | 101.6 | 1.6 |
| 1973 | 110.6 | 103.8 | 109.8 | 102.3 | 105.0 | 3.3 |
| 1974 | 120.8 | 125.2 | 137.6 | 123.0 | 126.1 | 20.1 |
| 1975 | 144.2 | 149.2 | 140.8 | 136.3 | 144.2 | 14.4 |
| 1976 | 154.1 | 148.5 | 143.1 | 143.0 | 146.9 | 1.9 |
| 1977p | 167.8 | 153.2 | 148.9 | 152.2 | 153.8 | 4.7 |
| 1976 I | 149.6 | 150.1 | 139.1 | 140.5 | 146.0 | -0.1 |
| II | 154.4 | 148.7 | 142.1 | 142.3 | 146.7 | 0.5 |
| III | 154.2 | 147.4 | 144.9 | 142.8 | 146.6 | -0.1 |
| IV | 158.5 | 148.0 | 146.2 | 146.2 | 148.3 | 1.2 |
| 1977 I | 168.8 | 149.2 | 146.6 | 148.8 | 150.7 | 1.6 |
| II | 167.9 | 151.0 | 152.2 | 153.0 | 153.4 | 1.8 |
| III | 166.2 | 156.1 | 150.0 | 152.4 | 155.3 | 1.2 |
| IV p | 168.2 | 156.8 | 147.0 | 154.7 | 155.9 | 0.4 |
| 1978 I p | 169.7 | 158.4 | 147.8 | 159.9 | 158.3 | 1.5 |

p: preliminary

¹ Percentage change from previous period (year or quarter).

Stefan noticed that, in some quarters, the material input index actually decreased against the previous quarter. The regional advisor added that it was theoretically possible for Stefan's escalation clause index to be lower at the end of the contract period than it was at the beginning. In such a case, Stefan's price for the job could be adjusted downward, unless the contract specified that the "current price" should be considered as the minimum price for the job.

The final phase in establishing the total input index was to regroup the labour input and material input indexes in a weighted total input index. This was done by determining the relative importance of labour and material in Stefan's cost of doing this job. Stefan estimated that, in recent years, materials would account for about 55% while labour would account for some 45%. Using these weights, they built a final table to provide Stefan with the index he would incorporate into his escalation clause.

Table 4

Final Weighted Input Movement

| Weights | Labour Input | | Material Input | | Total | |
|---------|--------------|----------------------|----------------|----------------------|-------|----------------------|
| | 45 | | 55 | | 100 | |
| | Index | %Change ¹ | Index | %Change ¹ | Index | %Change ¹ |
| 1971 | 100.0 | | 100.0 | | 100.0 | |
| 1972 | 114.8 | 14.8 | 101.6 | 1.6 | 107.5 | 7.5 |
| 1973 | 132.7 | 15.5 | 105.0 | 3.3 | 117.5 | 9.3 |
| 1974 | 146.2 | 10.2 | 126.1 | 20.1 | 135.1 | 15.0 |
| 1975 | 168.3 | 15.2 | 144.2 | 14.4 | 155.0 | 14.7 |
| 1976 | 197.7 | 17.4 | 146.9 | 1.9 | 169.8 | 9.5 |
| 1977p | 229.8 | 16.3 | 153.8 | 4.7 | 188.0 | 10.7 |
| 1976 I | 182.7 | 2.7 | 146.0 | -0.1 | 162.5 | 1.2 |
| II | 195.0 | 6.8 | 146.7 | 0.5 | 168.4 | 3.6 |
| III | 201.2 | 3.2 | 146.6 | -0.1 | 171.2 | 1.7 |
| IV | 212.3 | 5.6 | 148.3 | 1.2 | 177.1 | 3.4 |
| 1977 I | 218.0 | 2.7 | 150.7 | 1.6 | 181.0 | 2.2 |
| II | 229.8 | 5.4 | 153.4 | 1.8 | 187.8 | 3.8 |
| IIIp | 235.8 | 2.6 | 155.3 | 1.2 | 191.5 | 2.0 |
| IVp | 235.8 | .0 | 155.9 | 0.4 | 191.9 | 0.2 |
| 1978 Ip | 235.8 | .0 | 158.3 | 1.5 | 193.2 | 0.7 |

p: preliminary

¹ Percentage change from previous period (year or quarter)

The only task left was to monitor the various component indexes from time to time and use them to update his table. The Regional Advisor suggested that he document exactly, in the contract, the indexes that would be used and indicate clearly the weights assigned to each

index. Further he should state that, in case such indexes are not available anymore at the end of the contract, suitable replacements, as suggested by Prices Division, would be used (point f). Finally, the Advisor cautioned him to make sure he used revised indexes in all cases.

And that's not all

And that's not all

The case studies give an idea of the type of information available from Statistics Canada. But, they give only an idea. It is impossible to describe in this booklet all the publications and unpublished data which are available but it is important that readers have some appreciation for the scope and depth of this information.

For example, information relating to construction activities mentioned in the case studies is only a small part of the body of data produced by the Construction Division of Statistics Canada. Not only is there additional information available on construction — housing starts and completions and certain characteristics of building construction establishments and other such areas — but there is also information on machinery and equipment sales, wholesale trade for construction materials, and research and development expenditures in construction. Even though statistics from the *Census of Population* are used in one case study only, these have not exhausted the range of information produced from that survey. The Census, as it is commonly called, is by far the largest survey carried out by Statistics Canada, and it is an extremely important survey for the contractor as it is the main source, and in many instances the only source, of small-area data. The Census provides information on a wide variety of social and economic characteristics of the Canadian population, as well as a great deal of information on the stock of housing in the country.

One important source of information not mentioned in the case studies is the *Census of Manufactures* which is published annually in over 140 industry reports. Another is the publications on Canada's external trade. They give very detailed information on the quantity and value of commodities imported from, and

exported to, all the countries in the world. Still another valuable source not mentioned in the case studies is *National Income and Expenditure Accounts*, Catalogue No. 13-001. This report, published each quarter, provides measures of the economy's overall performance, including personal expenditures on consumer goods and services. In addition, Statistics Canada publishes data on employment, unemployment, earnings, transportation, energy, capital investment, and on many other subjects.

Although Statistics Canada does not normally publish forecasts, there are a few exceptions to this rule. Chief among them is the population projections for Canada and the provinces. The current projections (they are revised after each census) go to the year 2001 and provide estimates of the population by sex and five-year age groups. Statistics Canada also produces household and family projections. And, from time to time, Statistics Canada has forecast, either on its own or in conjunction with others, educational enrolments.

Most of the information requested by the users of statistics is available in the over 1,000 publications produced by Statistics Canada each year. If the information you want is not published, this does not mean that it is not available. It might be part of the body of unpublished material which is available on request. In addition to already prepared, unpublished information, it is possible for Statistics Canada to prepare from the data files special tabulations which are more closely tailored to a user's needs. As mentioned in one of the case studies, the Census is an area where special tabulations are undertaken for a modest fee. External trade is another area.

Finding and using statistics

Finding and using statistics

Where to get statistics and who to ask for help

Finding one's way through the more than 1,000 Statistics Canada publications may, at first, seem a formidable task but in fact is quite straightforward.

Firstly, there is a free Catalogue of Publications which lists and describes all Statistics Canada publications and has a subject index. For people who want to be completely up to date there is the weekly *Infomat* which lists the publications issued the previous week and features some of the highlights.

But the golden rule is: If in doubt — ask!

Statistics Canada's User Advisory Services has reference centres in nine cities across Canada from St. John's to Vancouver. Each has a collection of all Statistics Canada publications and a knowledgeable inquiries staff who answer a total of 200,000 inquiries a year and provide information on the sources of information and the meaning and uses of data. In each office there are one or more Regional Advisors. It is their job to help people with complex data problems and to promote the use of statistics through visits, talks and meetings with associations, business groups, etc.

The addresses of these offices are given on page 58 and, on page 56 there is a list of the more than 39 libraries across Canada which receive all Statistics Canada publications. Many other public libraries carry a selection of the major publications.

The purchase of individual copies of Statistics Canada publications can be arranged through the regional offices or by writing to:

Publications Distribution,
Statistics Canada,
Ottawa, Ontario. K1A 0T6

Alternatively, publications can be purchased through bookstores which act as agents for the Government of Canada.

Understanding the Jargon

Every occupation has its own language or jargon, and statisticians are no exception. However, there is no need for this to deter people from using the statistics. The following is a glossary of some of the unfamiliar words most frequently used in Statistics Canada publications. Users who require an explanation of other terms should consult the nearest User Advisory Services office.

Means and Medians

These are both ways of expressing a series of numbers by a single number. The *mean* most frequently referred to in Statistics Canada's publications is the arithmetic mean. It is what most people call the "average" and is calculated by adding up the numbers in the series and dividing the total by however many numbers there are. For example, if five children are aged 3, 4, 5, 8 and 10, their mean age is:

$$\frac{3 + 4 + 5 + 8 + 10}{5} = 6$$

The *median* is the value of the middle number of a series ranked in order of size. For example, given the ages of five children as 5, 4, 8, 3 and 10, to find the median age the series would first have to be rearranged in order of size, i.e., 3, 4, 5, 8, 10, and the value of the middle number, i.e., 5 would be the median age.

Time Series

Information collected or recorded at regular intervals through time — weekly, monthly or annually, — is called a "time series" or a "series". Statisticians speak of a series of numbers employed, a series of annual production, a series of monthly retail trade. A series may be made up of actual numbers (e.g., population, unemployed, job vacancies) or dollar values (shipments, inventories, purchases). It may also be in the form of an index.

Index Numbers and Indexes

Index numbers are a statistician's way of expressing the difference between two measurements by designating one number as the

“base”, giving it the value 100 and then expressing the second number as a percentage of the first. For example, if the population of a town increased from 20,000 in 1972 to 21,000 in 1977, the population in 1977 was 105% of the population in 1972. Therefore, on a 1972 base, the population index for the town was 105 in 1977.

An “Index”, as the term is generally used when referring to statistics, is a series of index numbers expressing a series of numbers as percentages of a single number. For example, the numbers

| | | | |
|--------------------------------|-----|-----|-----|
| 50 | 75 | 90 | 110 |
| expressed as an index would be | | | |
| 100 | 150 | 180 | 220 |

Indexes can be used to express comparisons between places, industries, etc., but the most common use is to express changes over a period of time, in which case the index is also a time series. One point in time is designated the base period — it may be a year, month, or any other period — and given the value 100. The index numbers for the measurement (price, quantity, value, etc.) at all other points in time indicate the percentage change from the base period.

If the price, quantity or value has increased by 15% since the base period the index is 115; if it has fallen 5% the index is 95. It is important to note that indexes reflect differences and not absolute levels. If the price index for one item is 110 and for another is 105 it means the price of the first item has increased twice as much as the price of the second. It does not mean that the first item is more expensive than the second.

Each index number in a series reflects the percentage change from the base period. It is important not to confuse an index point change and a percentage change between two numbers in a series. For example, if the price index for butter was 130 one year and 143 the next year, the index point change would be:

$$143 - 130 = 13$$

but the percentage change would be

$$\frac{143 - 130}{130} \times 100 = 10\%$$

Of course, if the comparison happens to start from the base period of the index, then point change and percentage change will be identical.

Current and Constant Dollars

When statistical tables give the value of, for example, sales, inventories or investment in current dollars, it simply means the values are expressed in terms of their price or cost at the time the survey or measurement was taken. However, the value (or purchasing power) of the dollar changes over time with inflation or deflation. For example, statistics may show that wages have increased substantially over a given period; but if prices have also gone up, the purchasing power of each wage dollar has decreased. To find out how much “real” wages, as opposed to cash wages, have increased, the wages have to be expressed in dollars which have a constant value over time, i.e., in constant dollars. Constant dollars can be used for any value which is expressed in dollars, or for indexes which reflect dollar values. When constant dollars are used in a statistical table, the value of the dollar in one particular year is selected and the year is always clearly stated. At present, most constant dollar series use 1971 dollars as that is the base year for most major national and international indexes.

Seasonal Adjustment

In Canada, the changing climate, or consumer habits related to it, affect nearly all business activity. Construction comes to a slowdown in winter; tourism increases in summer; the Christmas season brings out far more shoppers than any other. The demand for most goods and services changes along with the seasons; consumers want boots in winter, swim suits in summer, and so on. This sometimes makes it difficult to determine the underlying trend from an examination of a series of month by month figures.

For this reason, many series are adjusted to remove the effect of seasonal variations. To do this, seasonal factors for each month are calculated. For example, if, in a typical year,

sales in jewelry stores in March are 84 percent of average monthly sales, the seasonal factor for March for jewelry store sales would be 84. (Average monthly sales are the total annual sales divided by twelve). If sales in December are 174% of the average month's sales, the December seasonal factor would be 174.

Having determined the seasonal factors, the seasonally adjusted series is calculated by

dividing the value, quantity or index for that month, by the monthly factor, and multiplying by 100 because the factor is a percentage.

Here is an example of a series on department stores sales in Canada showing the monthly dollar value of sales, the seasonal factors and the seasonally adjusted value of sales. Note that the underlying trend is more clearly identified in the adjusted figures.

Department stores sales, Canada 1977

| Month | Unadjusted or actual sales (1) | Monthly factor (2) | Seasonally — adjusted sales $\frac{(1)}{(2)} \times 100$ |
|-----------|--------------------------------------|--------------------------|--|
| 1977 | Millions of dollars | | Millions of dollars |
| January | 413.5 | 72.98 | 566.6 |
| February | 393.6 | 68.92 | 571.1 |
| March | 479.8 | 85.85 | 558.9 |
| April | 533.7 | 96.77 | 551.5 |
| May | 539.8 | 95.86 | 563.1 |
| June | 526.0 | 96.89 | 542.9 |
| July | 509.9 | 90.47 | 563.6 |
| August | 554.9 | 91.37 | 607.3 |
| September | 606.0 | 104.56 | 579.6 |
| October | 578.6 | 101.10 | 572.3 |
| November | 751.9 | 120.59 | 623.5 |
| December | 1,053.3 | 178.46 | 590.2 |

Sales are not the only figures which are seasonally adjusted. Employment, inventories, consumer credit, consumer prices, industrial production and a number of other series are published both seasonally adjusted and unadjusted.

Sampling

Sometimes information cannot be collected from every person, company, etc., in the group being studied because it would take too long or be too costly. Instead, a portion of the group or industry — a sample — is scientifically selected so that the results which are obtained are representative of the group as a whole. In

general, the accuracy of the sample varies with its size, and this is determined on the basis of what constitutes an acceptable "sampling error" for the purpose at hand. For instance, a sample used to measure employment in a province may not produce accurate statistics for an individual city in that province. That would require a separate, specifically designed sample.

Census

A census is a survey in which information is collected from every person, company or institution in the group; in other words, it is a 100% sample. The most widely known census is the Census of Population which is taken every

five years and which involves every household in Canada. There are also censuses of industry — for example the Census of Manufactures, Census of Construction and Census of Merchandising and Services.

Classification Systems

The objective of classification systems is to provide a common framework so that comparable data can be secured from different sources. Classification systems are indispensable to the operations of a statistics agency. Over the years Statistics Canada has developed a number of classification systems. There are systems to classify commodities, imports, exports, geographical areas and occupations, to mention only the more widely known ones. But probably the most extensively used classification system is the Standard Industrial Classification (SIC).

The SIC is simply a method of classifying the activities that go on at the places where people work. This is done in terms of the “principal” commodity or service concerned. It covers everything from an abattoir to a zoological garden. Every kind of economic activity in Canada is classified to one of 12 divisions, then to a major group within the division, then to a group and in many cases to subgroups. The following excerpt from the SIC manual illustrates how some of the activities in construction are classified.

Major Group 1 — General Contractors

| | |
|--------|---|
| 404 | Building Construction |
| 404 40 | Residential Building |
| 404 80 | Non-Residential Building |
| 406 | Highway, Bridge and Street Construction |
| 409 | Other Construction |

Major Group 2 — Special-Trade Contractors

| | |
|--------|-------------------------------------|
| 421 | Special-Trade Contractors |
| 421 01 | Wrecking and Demolition Contractors |
| 421 03 | Water-Well Drilling Contractors |
| 421 05 | Septic Systems Contractors |
| 421 07 | Excavating and Grading Contractors |

| | |
|--------|--|
| 421 09 | Piledriving, Shoring, Underpinning and Caisson Contractors |
| 421 14 | Form Work Contractors |
| 421 16 | Steel Reinforcing Contractors |
| 421 18 | Concrete Contractors (Pouring or Precast and Finishing) |
| 421 20 | Concrete Dampproofing Contractors |
| 421 22 | Structural Steel Erection Contractors |
| 421 27 | Masonry Contractors (Brick, Block, Stone, Marble, Granite, Slate) |
| 421 29 | Terrazzo and Tiling Contractors (Ceramic, Marble, Granite, Slate) |
| 421 31 | Plumbing Contractors |
| 421 33 | Dry Heating and Natural Gas Piping Contractors (exclude Sheet Metal Duct Work) |
| 421 35 | Primary or Central Wet Heating, Cooling and Air Conditioning Systems Contractors (exclude Sheet Metal or other Duct Work and Related Air Handling) |
| 421 40 | Process Piping Contractors |
| 421 42 | Automatic Sprinkler Systems Installation Contractors |
| 421 44 | Unitary Heating and Cooling Systems Contractors (exclude Sheet Metal or Other Duct Work and Related Air Handling) |
| 421 46 | Commercial and Other Low Temperature Refrigeration Contractors |
| 421 48 | Environmental or Automatic Temperature Control Contractors |
| 421 53 | Millwright and Rigging Contractors |
| 421 55 | Electrical Contractors |

Confidentiality

In some tables published by Statistics Canada an x replaces a number and a note in the publication, usually in the first few pages, explains that the figure is confidential in order to meet secrecy requirements of the Statistics Act. In general, Statistics Canada is forbidden by law to publish any information which can be related to an individual person, business or organization. For business statistics this generally comes down to a “rule of three”, that is that no figure

which is made up of data on less than three firms can be published as one of the two would automatically know the facts about the other. While there are usually more than three firms classified to a particular kind of business or industry in Canada, there are often only two in a province or metropolitan area. Even when there are more than three firms, it is sometimes necessary to blank out the figures because one business dominates to such an extent that to publish the data would risk disclosing the firm's information.

Statistics Canada also has to be sure that it does not divulge confidential information by residual disclosure. If, for example, publishing information on widget store sales in Prince Edward Island is prohibited because there is only one widget store in the province, it is obviously impossible for Statistics Canada to publish statistics on widget store sales in each of the other provinces and territories and in Canada as a whole. If it did, it would be a simple matter to work out the figures for P.E.I. and, therefore, the figures for the only firm located there. In these cases Statistics Canada has to suppress the figures for at least one other province or publish only national or regional figures.

There are other ways in which residual disclosure can occur and Statistics Canada goes to great lengths to ensure the confidentiality of the information which is entrusted to it. That is one reason why sometimes it cannot provide the figures users want.

The dos and don'ts of using statistics

We said earlier that statistics are not difficult to use. This is true, but there are a number of pitfalls for the unwary and, while many of them can be avoided by common sense, some might not be readily apparent to the inexperienced user.

To begin with, users should always read the introduction, footnotes and explanatory notes and definitions published with the statistics to be sure the figures do measure what they think they measure. These notes give a clear explanation of the definitions and concepts used. If you need further information, contact Statistics Canada (see page 58).

The above can hardly be emphasized too strongly. There is a myriad of statistical information being released to the public each day via newspapers, radio, T.V. and magazines.

Much of it, however, had been summarized and adapted for news purposes, which is a fundamentally important use of the information. But news releases can be misleading or inconclusive when taken out of context and applied to a specific problem. It is very easy to form a wrong opinion when statistics are incomplete, or when one assumes too much in regard to them or accepts them at face value. For example, a city once claimed to be the "healthiest in the nation" because it had the lowest death rate. What was not mentioned was the fact that the city had no major hospital and most serious cases were hospitalized in neighbouring cities. Deaths were recorded where death actually occurred.

Always be wary of simple averages. Remember that they include the two extremes. If three photographers, for instance, have an average income of \$20,000 a year, their individual incomes could be \$15,000, \$16,000 and \$29,000, in which case the majority of photographers make substantially less than the average.

Make sure you compare like with like. If you are referring to more than one publication to obtain construction data, it is essential to read the notes on the concepts, methodology, scope and limitations to determine the differences between the information contained in the two publications.

A word of caution about forecasting is in order. Everybody forecasts — whether a contractor, retailer, or head of a family. Forecasting is necessary as many plans for the future require some action in the present. There are many methods of forecasting but they all involve using information about the past and present. If you study a time series and see a trend developing you may be inclined to forecast something in the future, based on the assumption that what has happened in the past will continue to happen. Remember that any such projection of past experience into an uncertain future involves a risk and should not be undertaken without consideration of other information on possible future developments or factors which could

cause a change. It is also wise to recognize that some statistical studies require the services of specialists — consultants trained in market research, forecasting, etc. Nobody should be frightened of using statistics but everyone should realize when they are out of their depth and it is time to bring in the experts.

And here is a final word of warning. Statistics are rarely 100% right. At best they are usually only approximations which, in most instances, are a little out of date. While Statistics Canada takes great pains to provide the best possible information, there are a number of factors, for example, sampling error, which can influence the accuracy of particular statistics. Of course, the accuracy of nearly all the data published by Statistics Canada is dependent on the accuracy of the information it receives in answer to its questionnaires. When using statistics, allowances should be made for accuracy

and users should avoid making too precise judgments on the basis of statistics alone.

This echoes what we said earlier — statistics are only one tool available to business people, and Statistics Canada is only one source of information. Other sources of information are important as well, including industry, associations, other federal government departments and agencies, provincial and local governments, chambers of commerce, trade journals, and so on. Contacts with associates and one's own observations on local business conditions should also be considered in reaching any decision. But as we have seen in the case studies, statistics can be very useful. Canadian businesses of all sizes have made an investment in Canada's official statistics, both through taxes and through the time taken to complete questionnaires. It is, therefore, only common sense to get some return on that investment.

Appendix

Canadian reference libraries receiving all Statistics Canada Publications

Memorial University Library,
St. John's, Nfld.

Dalhousie University Library,
Studley Campus,
Halifax, N.S.

Acadia University Library,
Wolfville, N.S.

Harriet Irving Library,
University of New Brunswick,
Fredericton, N.B.

Bibliothèque de l'université
de Moncton,
Moncton, N.B.

Ralph Pickard Bell Library,
Mount Allison University
Sackville, N.B.

Planning Library,
P.O. Box 2000,
Charlottetown, P.E.I.

Bibliothèque municipale,
1210 Sherbrooke east,
Montréal, Qué.

McGill University Library,
3459 McTavish St.,
Montréal, Qué.

Concordia University Libraries,
Montréal, Qué.

Bibliothèque des sciences humaines
et sociales,
Université de Montréal,
Montréal, Qué.

Bibliothèque centrale
Ministère de l'Éducation du Québec,
1685 est rue Fleury,
Montréal, Qué.

Bibliothèque de l'Université Laval,
Cité Universitaire,
Ste-Foy,
Québec, Qué.

Bibliothèque générale,
Université de Sherbrooke,
Cité Universitaire,
Sherbrooke, Qué.

York University Libraries,
4700 Keele St.,
Downsview, Ont.

University of Guelph Library,
Documentation Centre,
Guelph, Ont.

Hamilton Public Library,
Hamilton, Ont.

Mills Memorial Library,
McMaster University,
Hamilton, Ont.

Douglas Library,
Queen's University,
Kingston, Ont.

University of Western Ontario
Library,
London, Ont.

National Library of Canada,
Canadiana Acquisitions Division,
Government Documents,
Ottawa, Ont.

University of Ottawa Central
Library,
165 Waller St.,
Ottawa, Ont.

Laurentian University Library,
Sudbury, Ont.

Metropolitan Toronto Library,
789 Yonge St.,
Toronto, Ont.

University of Toronto Library,
Toronto, Ont.

Lakehead University Library,
Thunder Bay, Ont.

Public Library,
216 S Brodie St.,
Thunder Bay S, Ont.

Dana Porter Arts Library,
University of Waterloo,
Waterloo, Ont.

Windsor Public Library,
850 Ouellette Ave.,
Windsor, Ont.

Elizabeth Dafoe Library,
University of Manitoba,
Winnipeg, Man.

University of Saskatchewan Library,
Saskatoon, Sask.

University of Calgary Library,
Government Publications,
Calgary, Alta.

Edmonton Public Library,
Sir Winston Churchill Square,
Edmonton, Alta.

University of Alberta Library,
Edmonton, Alta.

Simon Fraser University Library,
Burnaby, B.C.

University of British Columbia Library,
Vancouver, B.C.

Vancouver Public Library,
750 Burrard St.,
Vancouver, B.C.

McPherson Library,
University of Victoria,
Victoria, B.C.

Northwest Territories Government Library,
Government of N.W.T.,
Yellowknife, N.W.T.

Note: Legislative Libraries also receive all
Statistics Canada publications.

Regional User Advisory Services

Central Inquiries Service,
Statistics Canada,
Ottawa, Ontario.
K1A 0T6
(613) 992-4734;
996-5254

St. John's
Statistics Canada,
P.O. Box 8556,
3rd Floor, Viking Building,
Crosbie Road,
St. John's, Newfoundland.
A1B 3P2
(709) 726-0713

Halifax
Statistics Canada,
1256 Barrington Street,
Halifax, Nova Scotia.
B3J 1Y6
426-5331

Montréal
Statistics Canada
Alexis Nihon Plaza,
1500 Atwater Avenue,
Montréal, Québec.
H3Z 1Y2
(514) 283-5725

Toronto
Statistics Canada,
25 St. Clair Avenue East,
Toronto, Ontario.
M4T 1M4
(416) 966-6586

Winnipeg
Statistics Canada,
Room 500, General Post Office,
266 Graham Avenue,
Winnipeg, Manitoba.
R3C 0K4
(204) 949-4020

Regina
Statistics Canada,
1783 Hamilton Street,
Regina, Saskatchewan.
S4P 2B6
569-5405 (359-5405 after May 1980)

Edmonton
Statistics Canada,
10th Floor, Baker Centre Building,
10025 - 106th Street,
Edmonton, Alberta.
T5J 1G9
425-5052 until March 1980
420-3027 after March 1980

Vancouver
Statistics Canada,
Main floor, 1145 Robson Street,
Vancouver, British Columbia.
V6E 1B8
(604) 666-3695

Toll-free access to the regional statistical information service is provided in Nova Scotia, New Brunswick and Prince Edward Island by telephoning 1-800-565-7192. Throughout Saskatchewan, the Regina office can be reached by dialing 1-800-667-3524 and in Alberta, the Edmonton office can be reached at 1-800-222-6400.

To subscribe to publications, please write to:

Publications Distribution,
Statistics Canada,
Ottawa, Ontario.
K1A 0T6

Recommended Publications for statistics relevant to the construction industry

From Statistics Canada

| Catalogue Number | Annual | | |
|------------------|---|---------|--|
| 13-211 | Fixed Capital Flows and Stocks | 64-210 | The Special Trades Contracting Industry |
| 61-205 | Private and Public Investment in Canada, Outlook | 71-202 | Corporations and Labour Unions Returns Act, Part II — Labour Unions |
| 61-206 | Private and Public Investment in Canada, Mid-Year Review | | Quarterly |
| 61-210 | Corporations and Labour Unions Returns Act, Part I — Corporations | 31-003 | Capacity Utilization Rates in Canadian Manufacturing |
| 63-224 | Market Research Handbook | | Monthly |
| 64-201 | Construction in Canada | 11-003E | Canadian Statistical Review |
| 64-203 | Building Permits | 61-005 | Indexes of Real Domestic Product by Industry |
| 64-204 | The Mechanical Contracting Industry | 62-007 | Construction Price Statistics |
| 64-205 | The Electrical Contracting Industry | 64-001 | Building Permits |
| 64-206 | The Highway, Road, Street and Bridge Contracting Industry | 64-002 | Housing Starts and Completions (formerly New Residential Construction) |
| 64-207 | The Non-Residential General Building Contracting Industry | 72-002 | Employment, Earnings and Hours |
| 64-208 | The Residential General Building Contracting Industry | | Occasional |
| 64-209 | The Heavy Engineering Contracting Industry | 13-568 | Fixed Capital Flows and Stocks, 1926-1978 |

Other References

| Publication Title | Source |
|---|--|
| Bank of Canada Review | Bank of Canada |
| Survey of Capital Investment Intentions | Department of Industry, Trade and Commerce |
| Construction Collective Agreements Survey Service | Canadian Construction Association |
| Canadian Housing Statistics | Canada Mortgage and Housing Corporation |

Remember

If you cannot find the figures you want, or you need help in using statistics, contact User Advisory Services at the nearest Statistics Canada office.

Statistics Canada publications are relatively inexpensive and available to everyone. If they do not contain the information you want it may be available in unpublished form.

For many statistics, special tabulations, more precisely tailored to your needs, can be provided at cost.

Always read the small print — the introduction, definitions and notes. Make allowances for the fact that most statistics are approximations.

Government statistics are only one of a number of sources of information available to decision makers.

Assistance may also be available from industry associations, labour groups and other federal, provincial and local construction organizations.

Don't be frightened of statistics but recognize your limitations and when you need to consult the experts.

